

**ALUMINUM ALLOYS**

There are many different aluminum alloys which the homebuilder should be familiar with in order to construct a safe airframe. Description of the various alloys are as follows:

**2024** - One of the best non heat-treated, high strength alloys with excellent fatigue resistance which is used extensively in aircraft construction. It is readily formed in the annealed condition and may be heat treated. Welding is generally not recommended. Applications include aircraft structural components, aircraft fittings and hardware, wheels and parts for the transportation industry.

**3003** - The most widely used of aluminum alloys, it is pure aluminum with manganese added which increases the strength approximately 20% over 1100 (pure aluminum). It has good corrosion resistance and with its excellent workability it may be deep drawn, spun, welded or brazed. An aircraft application is prop spinners.

**5052** - The highest strength alloy of the non heat-treatable grades. Fatigue strength is higher than most other alloys. Good resistance to marine atmosphere and salt water corrosion. Applications range from aircraft components to home appliances, marine and transportation industry parts.

**6061** - The least expensive and most versatile of the heat-treatable alloys with a wide range of good mechanical properties and corrosion resistance. It can be welded by all methods and can be welded by all methods and can be furnace brazed. It is available in Alclad ( a thin coat of pure aluminum), which improves corrosion resistance. Applications include truck bodies and frames, screw machine parts and structural components. 6061 alloy is used extensively in bolt-together aircraft airframes.

**7075** - One of the highest strength alloys available 7075 is ideally suited for high stress parts and is commonly used in aircraft structures. Arc or gas welding is not recommended. It is available in "Alclad" which improves corrosion resistance with only a minor reduction in strength. Use where highest strength is needed such as bearing housing and retention plates in rotor hubs. The accompanying charts indicate the characteristics of aluminum alloy plate and sheet that are suitable for aircraft construction. The most commonly used grades for structural components are 2024T3, 6061T6, and 7075T6. Tensile strength is listed in thousands of pounds per square inch (PSI) Bend radius is expressed in thicknesses of sheet and plate material. As an example 2t-4t denotes the minimum radius of a 1/4 inch plates should be 1/2 to 1 inch.

**ALUMINUM ALLOY CHARACTERISTICS**

ALLOY	TEMPER	GEN. AVAILABILITY				TYPICAL CHARACTERISTICS								SPECIFIED MECHANICAL PROPERTIES				
		F L A T	C O I L	C U T	P L A T E	C O R R O S I O N	C O L L O R I A L	M A C H I N I N G	B R A Z I N G	R E S I S T A N C E T O S E A M	WELDABILITY			Where range is shown, property varies with specific width and /or thickness dimensions				
											G A S	A R C	S P O T					
														Minimum	Maximum	Minimum	Maximum	Sheet
<b>Non-Heat Treatable Alloy</b>																		
1100	0	X	X	X	-	A	A	D	A	A	A	B	11	15.5	3.5'	-	15-30	90
	H14	X	X	X	-	A	A	C	A	A	A	A	16	21	14'	-	3-9	101
3003	0	X	X	X	-	A	A	D	A	A	A	B	14	19	5'	-	-	82
	H14	X	X	X	-	A	B	C	A	A	A	A	20	26	17'	-	1-7	92
5052	0	X	X	X	-	A	A	D	C	A	A	B	25	31	9.5'	-	15-20	130
	H32	X	X	X	X	A	B	C	C	A	A	A	31	38	23'	-	4-9	147
	H34	X	X	X	-	A	B	C	C	A	A	A	34	41	26'	-	3-7	147
<b>Heat-Treatable Alloy</b>																		
BARE 2024	0	X	-	-	X	C	B	D	D	D	C	B	-	32	-	14	12	205
	T3	X	0	0	0	C	C	B	D	D	C	A	63-64	-	42	-	10-15	205
	T351	-	-	-	X	C	C	B	D	D	C	A	56-64	-	40-41	-	-	205
	T42	-	-	-	-	C	C	B	D	D	C	A	58-62	-	38	-	12-15	-
ALCLAD 2024	0	X	X	-	X	A	B	D	D	D	C	B	-	30-32	-	14	10-12	205
	T3	X	-	-	-	A	D	B	D	D	C	A	58-63	-	39-40	-	10-15	205
	T351	-	-	-	X	A	D	B	D	D	C	A	56-63	-	40-41	-	-	205
	T42	-	-	-	-	A	D	B	D	D	C	A	55-61	-	34-38	-	10-15	-
6061	0	X	X	-	X	A	A	D	A	A	A	B	-	22	-	12	10-18	92
	T4	X	-	-	-	A	C	C	A	A	A	A	30	-	16	-	10-16	98
	T6	X	-	-	-	A	C	C	A	A	A	A	42	-	35	4-10	-	100
	T6	X	-	-	-	A	C	C	A	A	A	A	40-42	-	35	-	-	100
	T42	-	-	-	-	A	C	C	A	A	A	A	30	-	14	-	10-16	100
BARE	0	X	-	-	-	C	D	D	D	D	D	B	-	40	-	21	10	-
	T6	X	-	-	-	C	D	B	D	D	D	B	76-77	-	65-66	-	7-8	-
	T651	-	-	-	X	C	D	B	D	D	D	B	67-77	-	53-66	-	-	-
ALCLAD 7075	0	X	X	-	-	A	B	C	D	D	D	B	-	36-39	-	20-21	9-10	265
	T6	X	-	-	-	A	D	B	D	D	D	B	68-75	-	58-64	-	5-8	265

\*Ratings A, B, C, D are relative in decreasing order of merit. Weldability and brazability ratings are specifically defined as:

- A - Generally weldable by all commercial procedures and methods.
- B - Weldable with special technique or specific applications which justify preliminary trials or testing to develop welding procedure and weld performance.
- C - Limited weldability because of crack sensitivity or loss on resistance to corrosion, and all mechanical properties.
- D - No commonly used welding methods have so far been developed.